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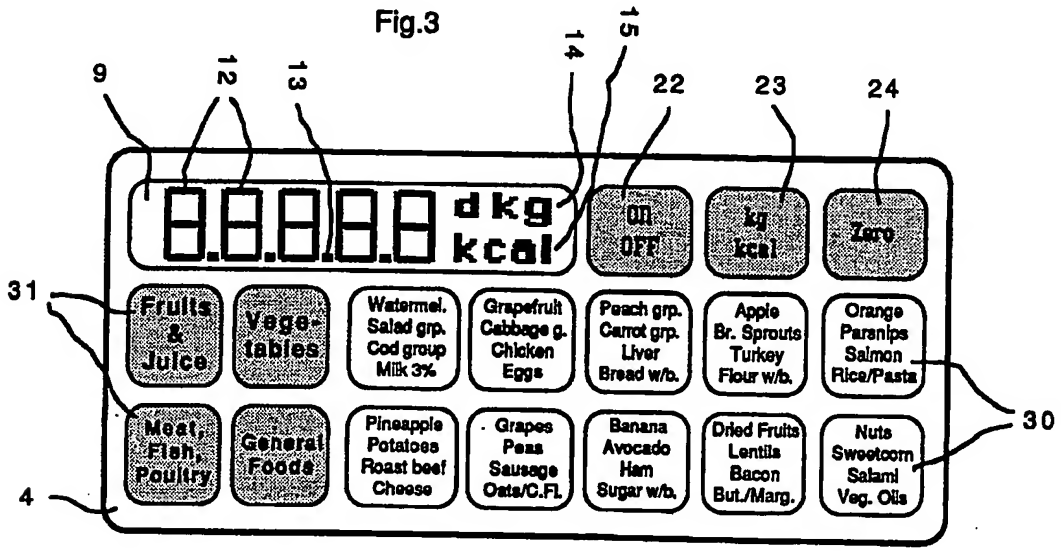
(54) A balance for calculating calorific values of foods

(57) A balance for the automatic estimation of the foodvalues of foodstuffs weighed, with a memory for holding their specific values and with a measurement sensor for determining the weights of the foodstuffs and an arithmetic unit for determining the total foodvalues of the weighed foodstuffs, exhibiting a keyboard 4, with groupkeys 31, for each of a foodstuff group and multiple-application foodstuff-keys 30, for at least one foodstuff each for these groups, whereby the particular foodstuff is defined through a combination of one of the group keys 31, with one of the foodstuff keys 30.

Fig.3



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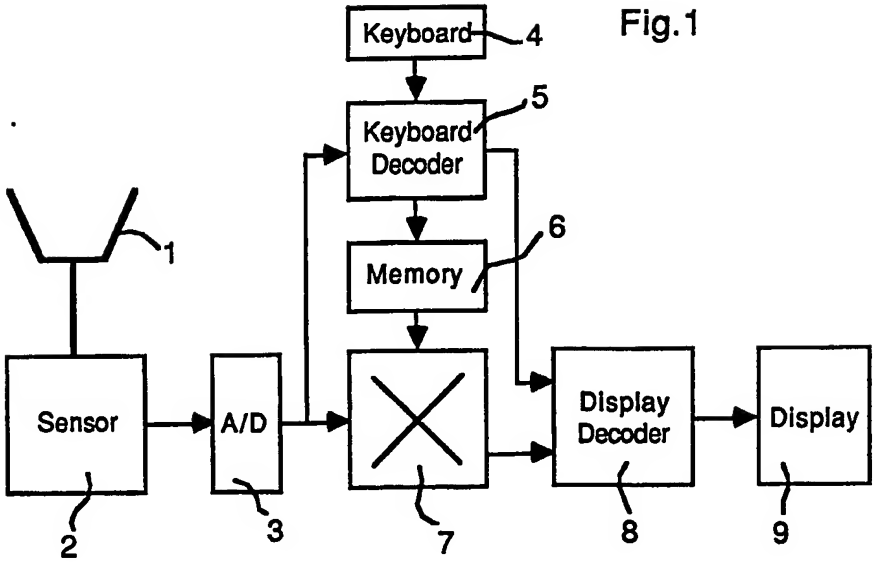
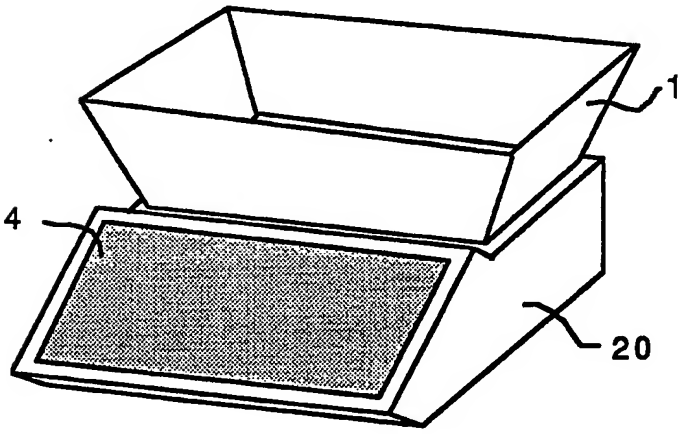

Keyboard
4
5
Keyboard Decoder
6
Memory
1
Sensor
A/D
Display Decoder
Display
2
3
7
8
9

Fig.1

Fig.2


1
4
20

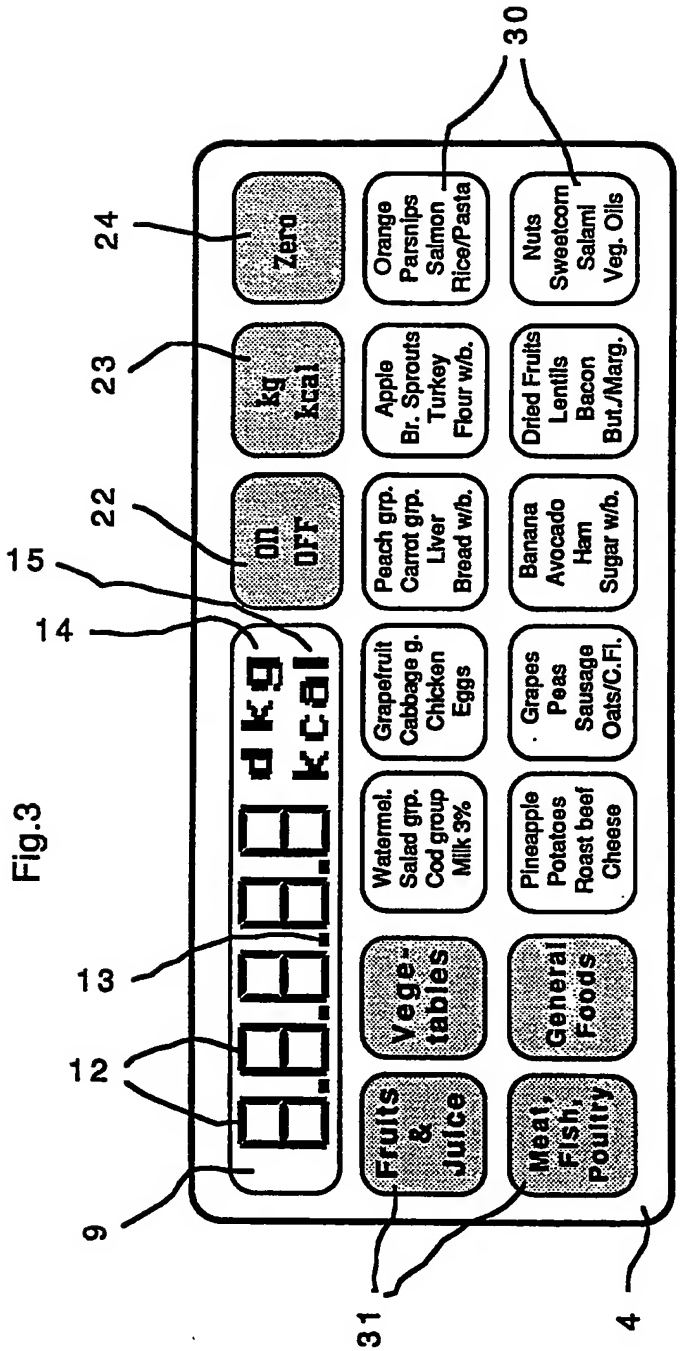

Zero
kg
kcal
ON
OFF
Fruits & Juice
Vege-tables
General Foods
Meat, Fish, Poultry
Watermel. Salad grp. Cod group Milk 3%
Grapefruit Cabbage g. Chicken Eggs
Pineapple Potatoes Roast beef Cheese
Grapes Peas Sausage Oats/C.Fl.
Peach grp. Carrot grp. Liver Bread w/b.
Apple Br. Sprouts Turkey Flour w/b.
Banana Avocado Ham Sugar w/b.
Dried Fruits Lentils Bacon But./Marg.
Orange Parsnips Salmon Rice/Pasta
Nuts Sweetcorn Salaml Veg. Oils
24
23
22
15
14
13
12
9
30
31
4

Fig.3

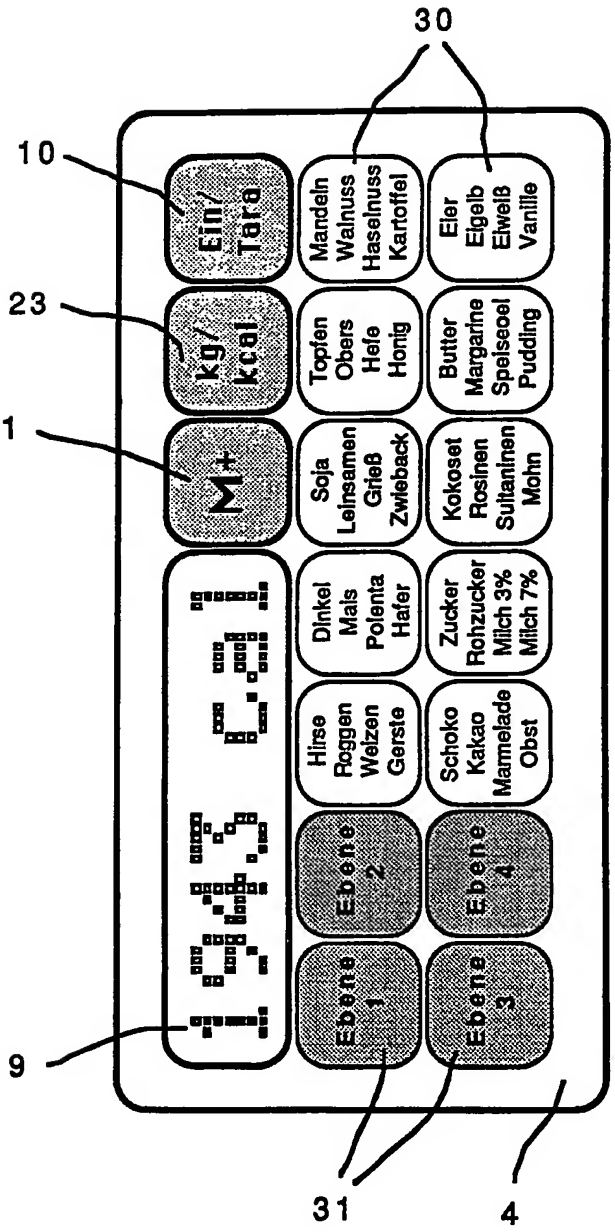

30
10
23
11
9
31
4
Ein/ Tara
kg/ kcal
M+
Ebene 1
Ebene 2
Ebene 3
Ebene 4
Mandeln Walnuss Haselnuss Kartoffel
Eier Eigelb Eiweiß Vanille
Topfen Obers Hefe Honig
Butter Margarine Speiseoel Pudding
Soja Leinsamen Grieß Zwieback
Kokoset Rosinen Sultaninen Mohn
Dinkel Mais Polenta Hafer
Zucker Rohzucker Milch 3% Milch 7%
Hirse Roggen Weizen Gerste
Schoko Kakao Marmelade Obst

Fig.4

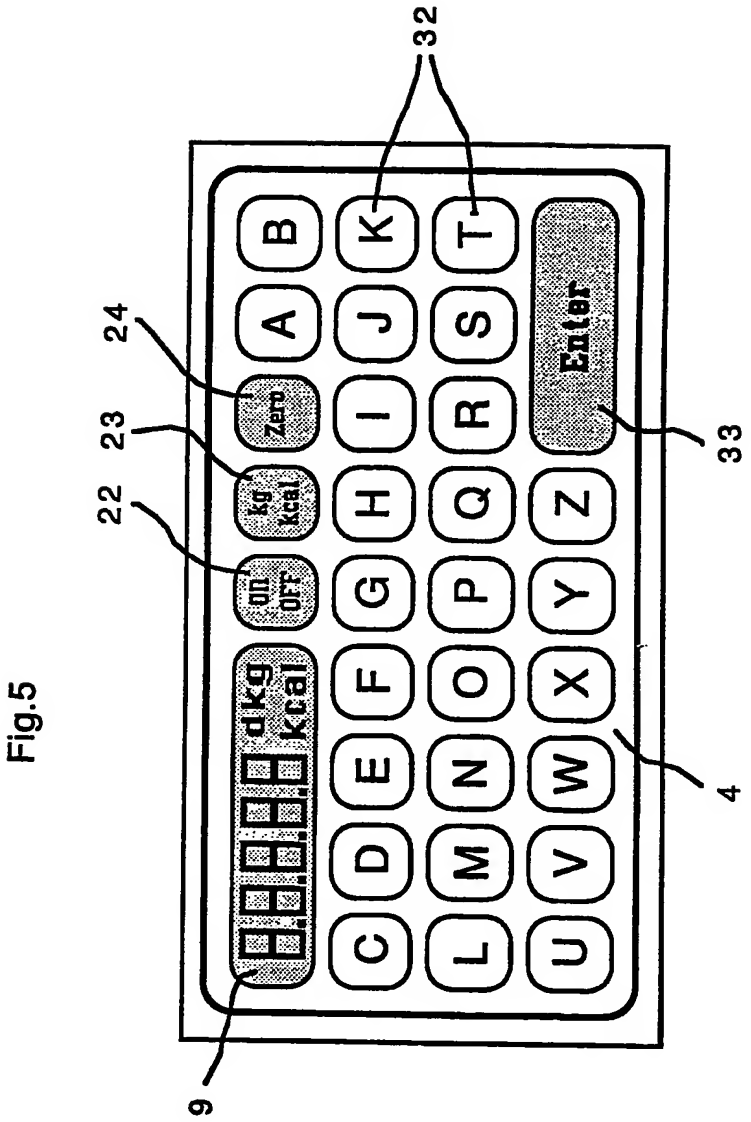

32
24
23
22
9
33
4
Zero
kg
kcal
ON
OFF
dkg
kcal
Enter
A
B
C
D
E
F
G
H
I
J
K
L
M
N
O
P
Q
R
S
T
U
V
W
X
Y
Z

Fig.5

Fig.6

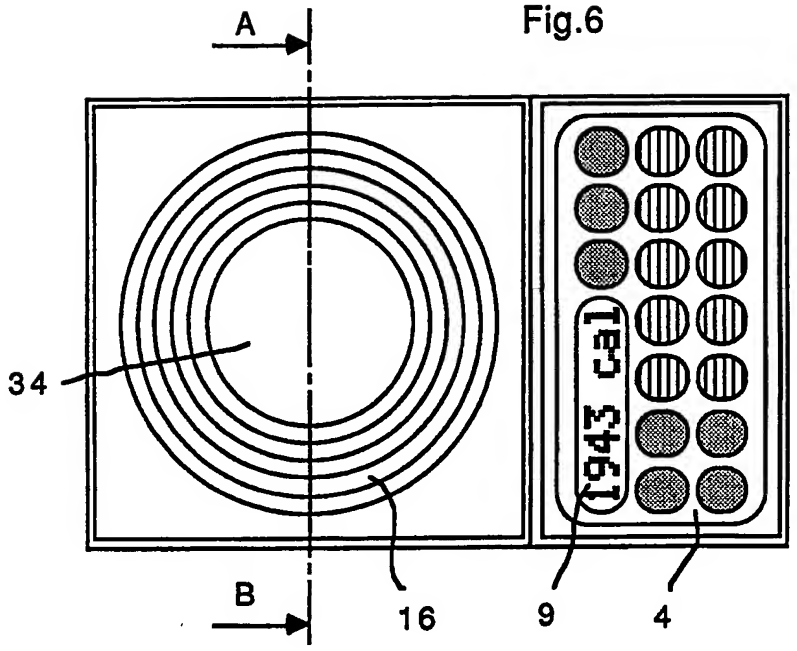


Fig.7

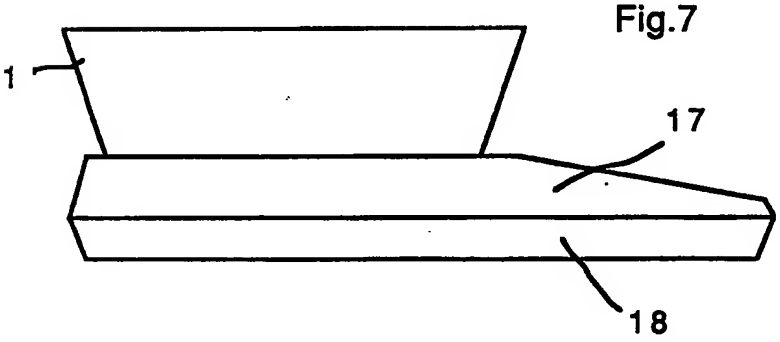


Fig.8

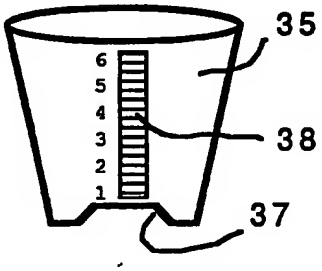


Fig.9

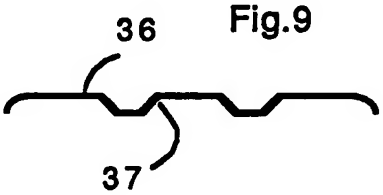


Fig.10

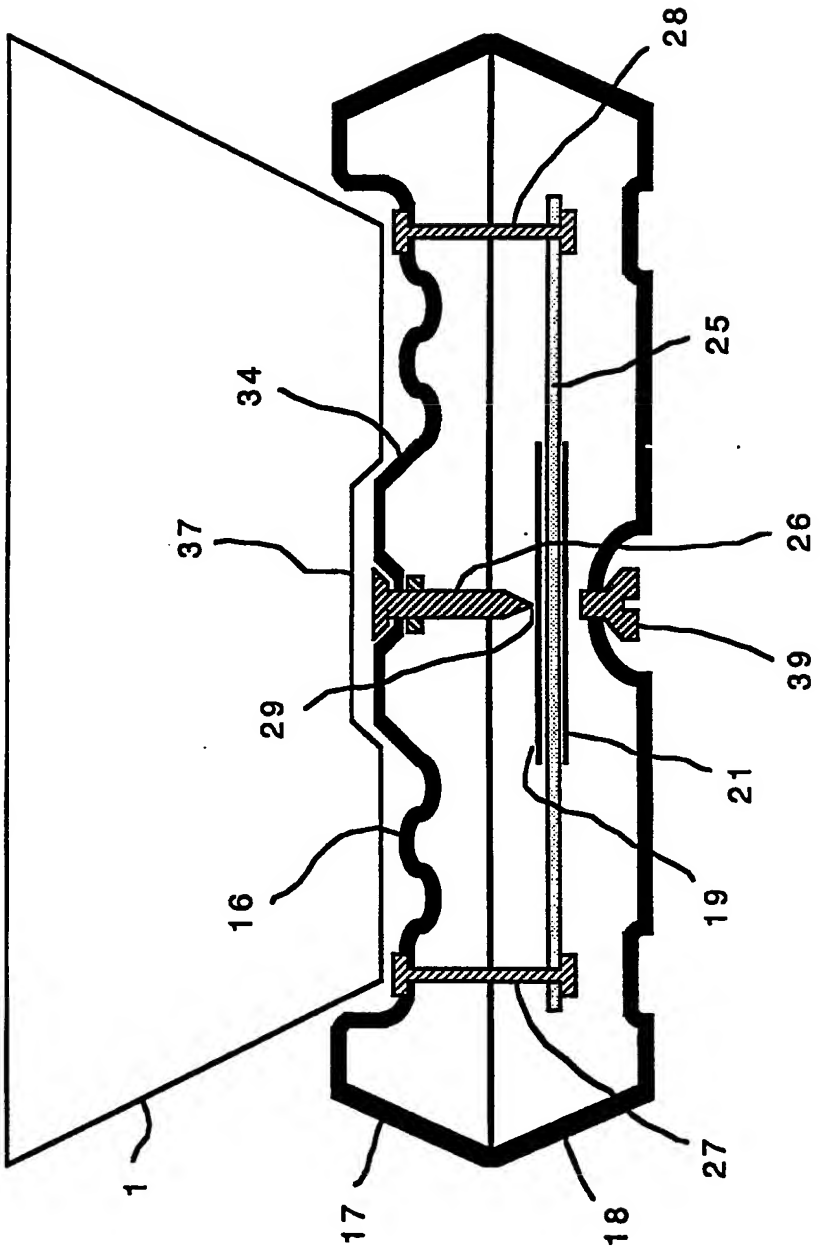


Fig.11

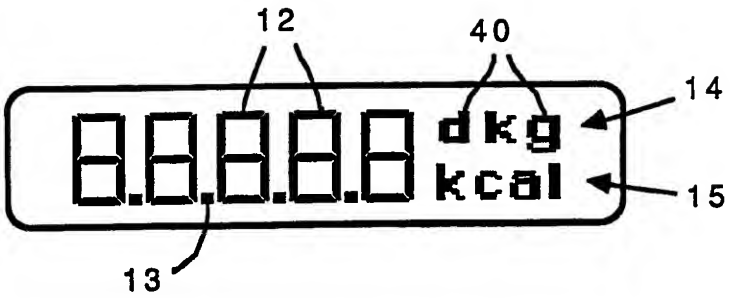


Fig.12

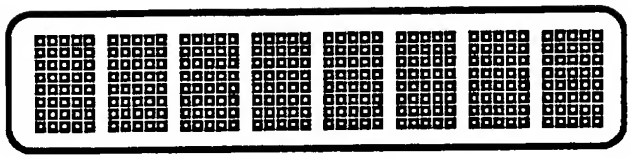


Fig.13

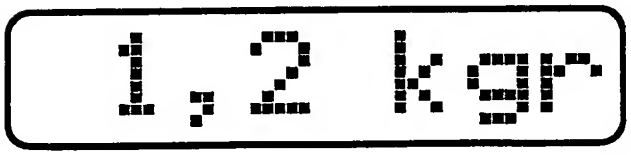


Fig.14

Fig.15

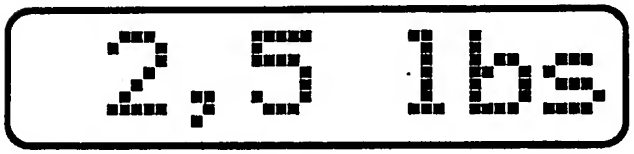
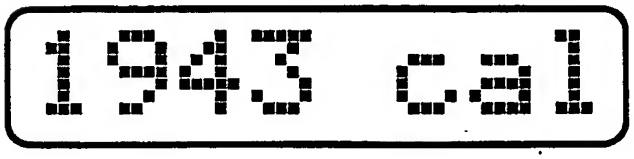


Fig.16



A BALANCE FOR THE ESTIMATION OF FOOD- VALUES IN FOODSTUFFS

This invention relates to a balance for the estimation of the energy-values (food-value) contained in portions of foodstuffs.

A correct diet frequently results in an improved sense of well-beeing. As a consequence, those people who are food conscious, or those who wish to slim, have an especial interest in knowing the energy-values of various foodstuffs.

It is for this reason that information can be found with increasing frequency on food-packaging as well as from the usual tables of food-values in cookbooks, etc. To determine the approximate total number of calories in a given portion of a foodstuff it is first necessary to weigh that portion and then to make a calculation employing quoted values per specified weight or volume. Normally these specified food-values are given as kilocalories per 100 g weight or per 100 ml fluids, and so, in the majority of cases, a pocket calculator is required to determine the total calorie-value contained in the desired portion. Known diet balances achieve this in a long-winded way by which food values from a table are fed in by means of a number keyboard.

By means of this invention this procedure is simplified and automated. This is achieved by means of an electronic balance in the memory of which is a pre-set table of specific energy-values for a variety of foodstuffs, and the weight of the foodstuff is measured at the same time. The total calories in a portion of food are then shown directly by a display. The weight of a food portion being measured can also be directly displayed in grams.

Through selection of the respective foodstuff on a keyboard the weight of it is measured and is automatically multiplied by the specific calorie-value from the table in the memory and the total contained value of the portion is shown on a display.

The balance relating to this innovation, particulary in the form of a kitchen scale, has an electronic measuring device. The balance is provided with a housing that has a sloping, desk-shaped front. In the upper part of this casing in mounted a waterproof plastic-mambrane keyboard on which the most common foodstuffs are shown.

As there is a number of foodstuffs which show only a minimal difference one from the other in energy-values, then these various foodstuffs may be placed together in groups. In order to be able to select a sufficient number of foodstuffs on the balance keys are provided which have a multiple application, i.e. each is imprinted with several different foodstuffs. In this way the appropriate foodstuff may be selected by a combination of two keys.

The keyboard is preferably divided into two zones, with the keys for selection of the food-group in one zone and the keys for the desired food item within that group are found in the second zone. (i.e. the multiple-application keys).

Through selection of a foodstuff group and subsequent selection of a foodstuff on a multiple-application key then a relatively large number of combinations can be achieved, each representing a food-stuff.

A further version of the invention may have an alphanumeric keyboard with an entry-key. Such a version is particulary useful in large kitchens where calorie-values have to be applied to a large number of food-stuffs. A very large number of foodstuffs can be reached by feeding in the significant words. The memory for the application of the specific energy-values can be increased for this model of the balance.

Relative to the invention there is a display-unit provided which portrays the food-value and also, by selection, shows the actual weight of the food portion.

The display-unit is preferably made with an L.C.D., with numerical figures and decimal points, and which is activated after each contained food-value has been calculated. On the display an area is provided for showing the weight in kg. or dkg. and g., and a separate area to show the contained foodvalues of the portion in kilocalories or, optionally, kilo-Joules.

A further version of the balance may display weight in pounds and ounces. Switching from the display of weight to the display of calories is carried out by means of a key on the plastic-membrane keyboard. Another key is provided which switches the appliance on and off. Of particular advantage, is a zero-reset or tare key with which to obtain the value zero on the display when, for example another container is placed on the balance pan. The weight of that container is then subtracted when the tare key is operated.

The whole balance is preferably powered by battery fitted in its own compartment within the balance casing, or powered by the mains via an adaptor.

The following are the various design forms for the balance and are illustrated in the attached drawings. In these are schematically shown:

Fig. 1. The block circuit-diagram of one version of the balance.

Fig. 2. A perspective representation of one form of the balance.

Fig. 3-5. Various designs of the keyboard with display arrangement.

Fig. 6. A plan view of another design of the balance.

Fig. 7. A side view of the balance relating to Fig. 6 showing upper and lower half-shells as the casing.

Fig. 8. A removable measuring beaker.

Fig. 9. A removable flatpan.

Fig. 10. A section along the line A-B in Fig. 6 showing the diaphragm and measuring sensor.

Fig. 11. An illustration of the display produced for a specific use.

Fig. 12-16. Various illustrations of a Dotmatrix-LC-display.

As is shown in the block-diagram in Fig. 1, the weight information delivered from the measuring sensor 2, is converted into a digital dataword by means of an A/D-convertor 3, and passes to a multiplier 7. Through the combination of a groupkey 31, with one of the foodstuff keys 30, the desired foodstuff can be selected. In this case the memory 6, relating to an address in a combination of keys is activated by the keyboard-decoder 5, and the corresponding dataword for the specific food-value, which is defined in the memory, will then be delivered to the multiplier 7.

Through the mathematical multiplication of both datawords a new dataword is obtained which corresponds to the total calorie-value contained in the foodstuff portion. This value is decoded by means of the display-decoder 8, and shown on the display-unit 9, as a number.

A further possibility exists to lead the dataword, which is delivered from the A/D-convertor 3, directly to the keyboard-decoder 5, and by operation of the weight/calorie key 23, it is switched to the weight display. The dataword will then be led directly to the display-decoder 8, in which it is decoded and shown on the display 9, as the weight of the food-portion.

The keyboard 4 is shown in Fig. 3 including the display-unit 9, and the on/off-key 22, as well as the key 23, for switching the mode from weight measurement to energy-value measurement. Additionally a tare-key 24, is provided which gives a zero reading of the numbers on the display-unit 9, when, for example, a different container is used on the balance-pan 1, or to compensate for any possible permanent error.

In a further version of the keyboard shown in Fig. 4, the on-switch 22, and the tare-key 24, as per Fig. 3, can be replaced by a common key so that, on one hand, by switching the balance on, and regardless of which pan is in use, an automatic zeroing is obtained. On the other hand, by pressing the same key 10, again a manual zero- or tare-position is obtained. The electronics then take care that the balance is switched off automatically after about five minutes of non-use, saving the need for an off-key 22. In the space made available by not using the zero/tare key 24, a memory key 11, can be used which permits the adding-up of various foodvalues to give a total energy-value, possibly for an entire dish or meal.

The display arrangement 9, in Fig. 3 shows numerical figures 12, and decimal points 13, which are activated after each measurement and calculated value. Further there are on the display-unit 9, the alphanumeric fields 14, 15, for showing the weight measurement in kg., dkg., or g. or the food-value in kcal, each of which may be individually controlled..

Instead of the display having a specific form, as per Fig. 11, a character type Dot-Matrix-Display may also be provided, Fig. 12, on which all numbers, decimal points and alphanumeric signs can be illustrated in a line. In this way the portrayal of information in other languages can be guaranteed. The keyboard decoder 5, then assumes the function of correctly controlling the display.

Fig. 2 shows a perspective arrangement of the balance which relates to the invention, having a desk-shaped casing 20, and a measuring-pan 1, in position, as well as the keyboard 9, set into the casing.

The following is a table of selected foodstuffs, indicating their specific food-values, expressed in kcal per 100 g. weight of the respective foodstuff, and from which foodstuff or food-value groupings can be formulated.

In this table it may be seen that many foodstuffs themselves exhibit group values, i.e. that vary little one from another. By establishing the specific food values of the foodstuffs in a group, an average value may be calculated but with those items in the last positions in a group being excluded, as indicated exceptions, from the calculation of the average value. As can also be seen from the tables of food-values it is permissible to take an average value for cheese, for example of 388 kcal / 100 g , or 670 kcal / 100 g for nuts in general.

Fruits:			Vegetables:		
	Melon	26		Cucumber	10
	Strawberry	37		Zuchini	11
	Raspberry	40			
	Lettuce	15			
	Kiwi	45		Chinese leaf	16
	Nectarine	46		Tomato	19
	Peach	46		Asparagus	20
	Cranberry	46		Radish	20
	Mandarin	48		Spinach	23
	Blackberry	48		Cabbage	25
	Orange	54		Kohlrabi	26
	Apricot	54		Red Cabbage	27
	Apple	55			
	Pear	55		Cauliflower	28
	Pineapple	56		Pumpkin	28
	Plum	62			
	Bilberry	62		Green Beans	33
	Blueberry	62		Beans	33
	Mango	63		Carrots	35
	Cherry	63		Onions	45
	Grapes	74		Artichoke	61
	Bananas	90		Peas	87
	Avocado	200		Lentils	354

Fish:	Mussels	72	Meat/Poultry:	Partridge	111
	Cod	78		Pheasant	143
	Plaice	83		Chicken	144
	Perch	89		Turkey	175
	Pike	89		Duck	243
	Tench	85		Goose	370
	Perchpike	94		Venison	123
	Trout	112		Lean Pork	176
	Bream	125		Fat Pork	358
	Tuna	148		Lean Beef	126
	Carp	151		Fat Beef	253
	Mackerel	193		Lean Lamb	118
	Salmon	217		Fat Lamb	253
	Eel	297		Salami	526
Flours:	Millet	336	Cheese:	Cream-cheese	361
	Rye	360		Gorgonzola	361
	Wheat	363		Goatsmilk	390
	Barley	369		Appenzeller	400
	Spelt	369		Gauda	401
	Corn/Maize	375		Parmesan	410
	Maize	376			
	Oats	410	Nuts:	Pistachio	642
	Linseed	421		Peanuts	650
	Soya	469		Almond	651
				Hazelnut	694
Basic Food:	Potato	87		Walnut	705
	Tofu	100			
	Raisin	271	Farinaceous:	Wholemeal br.	239
	Semolina	370		Toast/White	250
	Rice	371		Farmersloaf	250
	Sugar	394		Ryebread	253
	Cocoa	472		White bread	260
	Poppyseed	536		Linseed	275
	Butter	776		Biscuit	400
	Cooking oil	927			

Also in the general range of flours and of fruit and vegetables the difference between them, apart from a few exceptions, are not significantly high. Therefore it is expedient, in a further version of the keyboard 4, as per Fig. 3, to show these exceptions as separate items on the multiple-application foodstuff keys.

The actual energy-value of a foodstuff is dependent on many factors, especially the fat-content. The balance will therefore be programmed to estimate a foodvalue that may be expected to occur within the variations of a particular item. This applies particularly in the case of the many types of meat in which the fat-content may vary very widely. In the version of the keyboard 4, in Fig. 3, the specific values in the memory only relate to lean meats.

In Fig. 3 a design of the keyboard 4, is depicted in which the keys 31, for the foodstuff groups are placed together on the left-hand part of the keyboard 4, and the multiple-application foodstuff keys 30, are situated on the right-hand side of the keyboard. On it the commonest foodstuffs are incorporated, especially for domestic use, so that they are separated into the groups Meat, Fruit, Vegetables and Basic foodstuffs. The foodstuff keys are accordingly imprinted with more than a single item and this permits a total of 40 combination possibilities to be used, each one for a different specific energy-value. Provision is made for the keyboard 4, to be user-specific and that it may be imprinted with foodstuffs other than those illustrated in Fig. 3. Other versions of the keyboard 4, are intended such that it carries additional keys 31, for foodstuff groups and additional keys 30, for foodstuff items. These may be introduced in the rows or free spaces for example or on a larger keyboard or by changing the size of the keys, and the number of combinations will then be increased.

In Fig. 4 a keyboard 4, is depicted which is very similar to the multiple-application keyboard in Fig. 3. On this the group keys are provided simply with general markings (levels 1 - 4), (lines 1 - 4), which opens the further possibility of making the foodstuff keys 30, individual and not dependent upon groups of items and their respective keys.

The selection of a foodstuff will then be made through the combination of a foodstuff key 30, with one of the group keys 31, of the level 1 - 4. As an example a keyboard is depicted in Fig. 4 which is printed for use on a balance that is to be used purely for baking purposes. By creating the groupkeys 31, in different colours and by the application of those colours to the individual, group-related, markings on the foodstuff keys 30, i.e. by having a colour code, then the operation of the balance is made easier and is intuitively improved.

The model shown in Fig. 5 holds the possibility of programming the memory 6, with a large number of foodstuffs whereby each foodstuff must be entered on the keyboard 4, with the alphanumeric keys 32, in full word or as text. With the entry key 33, the input of the text is confirmed, entered and sent on to the keyboard decoder 5. The keyboard decoder 5, is so made that the words or text are pre-programmed in the memory 6, and, on the basis of the key combination of the alphanumeric keys 32, the corresponding specific energy-values of the foodstuffs in the memory 6, are recalled and issued. Exchange of the memory 6, is provided for and an external programming of the same to extend the number of the specific foodvalues as well as the text for the foodstuffs.

In a further design of the balance shown in Fig. 6 and 7 and as per Fig. 10 there is a measuring system, made from a diaphragm 16, that is already integrated in the casing upperpart 17, and the sensor 2, beneath the diaphragm.

A particular advantage exists in that, simultaneously with the production of the casing upper-part 17, the diaphragm 16, which can be of the same plastic material as the casing 20, is formed in a single operation. This can be manufactured by the pressing of hot plastic sheets or produced by injection moulding.

Through a suitable choice of the materials for compounding the plastic, and the plastic thickness, the properties of the diaphragm are decided.

A further advantage exists in that, as a result of this design, neither moisture nor dirt or cooking residues or spilled foodstuffs can soil the interior of the balance since there is no opening whatsoever through which dirt can enter. Because of this the weighing accuracy is maintained for a long period and cannot be affected by moisture etc.

As is seen in Fig. 10 the measuring device consists primarily of two tension-strips 19, 21, which are fixed to both the upper and lower sides of a leaf-spring 25. The tension-strips are preferably switched together in a bridge circuit so that a high sensitivity is reached with only minimal deflection of the diaphragm 16. The sensor 2, can also be made as a piezo-resistive pressure sensor, as a capacitive or inductive sensor, as an optic sensor, or can also be made as a Hall-element.

A simple and cost-effective manufacture is ensured by the method of construction. In the centre of the diaphragm 16, a pestle 26, is simply fixed. The leaf spring 25, to which the tension-strips 19, 21, are attached is secured by two screw-fixings 27, 28. The pestle 26, has, at the point of contact with the upper tension-strip 19, a pressure point 29, that is lightly pressed against when in the zero-position.

When weight is determined the diaphragm 16, is depressed and in the same measurement both tension-strips 19, 21, are flexed. Precicely, the upper tension-strip 19, is under compression and the lower tension-strip 21, is under tension. The determination of weight is made through the difference measurement with the bridge circuit.

Further, the plastic diaphragm 16, exhibits a raised conical section near the centre so that the measuring pan 1, can be placed securely in position. Further there is provision for a measuring jug 35, in addition to the balance pan, Fig. 8, for fluids and juices. A flat-pan 36, Fig. 9, is also provided which has an indentation 37, to correspond with the raised section 34, onto which it fits. This pan 36, permits the balance to be used for weighing other articles, for example letters and parcels.

The measuring beaker 35, may be calibrated for the measurement of fluids and fluid mixtures. These additional items all have their bases formed so as to fit on to the raised section 34, on the balance and to stand firmly on it. In Fig. 10 an adjustment screw 39, is provided in the lower part of the casing 18, to adjust the maximum deflection of the measurement sensors 2, so that these are not bent too far, and additionally to limit the maximum weight. The leafspring 25, is held at opposite ends on a support provided by the bolts 27, 28, and which is fastened outside the diaphragm 16, on the upper part of the balance casing 17.

PATENT CLAIMS

1. A balance for the estimation of the contained energy-value of portioned foodstuffs weighed with the balance, with a memory in which are stored details of the specific food-values of various foodstuffs, and which is linked to the provided keyboard on entry of one of the kind of foodstuffs to be weighed, with a measuring sensor for determining the weights of the foodstuffs to be weighed, with an arithmetic unit that is linked with the memory and measuring sensor and which multiplies the specific food-value data that are retrieved from the memory by the weight data that are determined by the measuring sensor, and with a display arrangement to show the food-values determined by the arithmetic unit for the weighed foodstuffs, characterized by a keyboard 4, showing group-keys 31, for each one a foodgroup, and multiple-marked foodstuff-keys 30, for at least one foodstuff each of these groups shown, and that the group-keys 31, and the foodstuff keys 30, are linked through a keyboard decoder 5, with the memory 6, whereby the particular foodstuff is identified through the combination of one of the group-keys 31, with one of the foodstuff-keys 30.

2. A balance in accordance with claim 1, characterized by a keyboard decoder 5, linked with an arithmetic unit 7, with the display unit 9, linked with a display-decoder 8, and the keyboard 4, having a key 23, from which the weight data that are delivered from the Analog/Digital convertor 3, may be lead to the keyboard decoder 5, and the display decoder 8, of the display arrangement.

3. A balance in accordance with claims 1 or 2 characterized by the fact that the foodstuff-keys 30, that are meant for such foodstuff of a foodstuff group,. show one which for this group has a particularly high or a particularly low specific foodvalue.

4. A balance in accordance with one of the claims 1 to 3, characterized by the keyboard 4, exhibiting a tare-key 24, for adjustment of the display arrangement 9, to the zero position.

5. A balance in accordance with claim 4, characterized by the key 24, for the zeroing of the display arrangement 9, and the key 22, for bringing the balance into operation forming a common key 10.

6. A balance in accordance with one of the foregoing claims characterized by the group-keys 31, of the foodstuff group being provided with generally applicable markings (level 1 to 4) and the foodstuff-keys 30, exhibiting markings of the foodstuff which are independent from the group-keys 31.

7. A balance in accordance with one of the foregoing claims characterized by the measuring sensor 2, exhibiting a diaphragm 16, for the reception of the foodstuff to be weighed, and a pressure-sensor to which pressure is applied from the diaphragm 16.

8. A balance in accordance with claim 7 characterized by a diaphragm 16, which is formed as one piece with the upper part 17, of the casing.

9. A balance in accordance with claim 7 and 8, characterized by the fact that the diaphragm 16, exerts influence on the measurement sensor through a pestle 26.

10. A balance in accordance with one of the claims 7 to 9, characterized by a pressure sensor formed by two tension-strips 19, 21, that are fixed on both sides of a leafspring 25.

11. A balance in accordance with one of the foregoing claims, characterized by a measuring pan 1, a measuring beaker 35, and a flat-pan 36, being provided for the balance and of which at least one exhibits a recess 37, in it's underside.

12. A balance in accordance with claim 11, characterized by the diaphragm 16, exhibiting in its central area a raised section 34, that conforms with the recess 37.

13. A balance in accordance with one of the foregoing claims, characterized by the fact that the keyboard 4, exhibits a key 11, for the memorizing and addition of various weight data or foodvalue data.

14. A balance in accordance with the foregoing claims, characterized by a display 9, having an area with numbers 12, and decimal points 13, and a section with alphanumeric fields 14, 15, whereby the segments 40, can be controlled individually and in combination from the display-decoder 8.

Patents Act 1977
Examiner's report to the Comptroller under Section 17 (The Search Report)

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Relevant Technical fields

(i) UK Cl (Edition L) G1W

(ii) Int Cl (Edition 5) G01G

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Databases (see over)

(i) UK Patent Office

(ii)

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Documents considered relevant following a search in respect of claims ALL

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
X	GB 2229541 A (WALSH) - see Claim 1	1
X	GB 2133166 A (PALMER) - Note page 1 lines 34 to 39	1
X	WO 86/07447 (SENTRON) - see Figure 1, page 2 lines 9 to page 3 line 5	1

Category	Identity of document and relevant passages	Relevant to claim(s)

Categories of documents

X: Document indicating lack of novelty or of inventive step.

Y: Document indicating lack of inventive step if combined with one or more other documents of the same category.

A: Document indicating technological background and/or state of the art.

P: Document published on or after the declared priority date but before the filing date of the present application.

E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.

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Databases: The UK Patent Office database comprises classified collections of GB, EP, WO and US patent specifications as outlined periodically in the Official Journal (Patents). The on-line databases considered for search are also listed periodically in the Official Journal (Patents).